

LAMONT-DOHERTY
EARTH OBSERVATORY
THE EARTH INSTITUTE AT COLUMBIA UNIVERSITY

Jamaica Bay Blue Carbon Project 2015

By Stephen Kovari and Mohammad Reza

What is a Marsh?

- A tract of low, wet, soft land that is temporarily, or permanently, covered with water, characterized by aquatic, grass like vegetation; swamp; bog; morass; and fens
- Types of Marshes
 - Tidal
 - Freshwater
 - Salt
 - Non-tidal



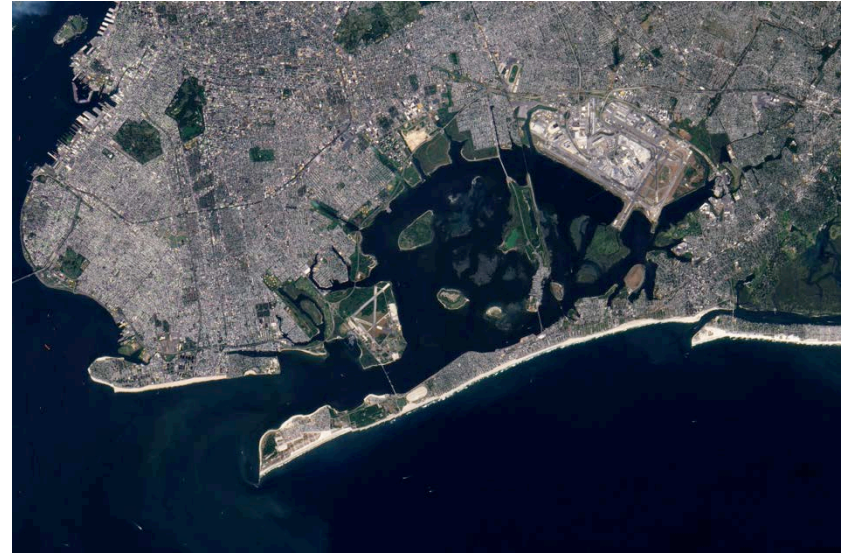
Clapper Rail
Photo by Stephen Kovari

Jamaica Bay, New York

The bay is located between Queens and Kings counties in New York City. Approximately 8 miles long and 4 miles wide - covering approximately 26 total square miles.

In less than 70 years between 1924 to 1994, the bay has lost 1306 acres of marshland due to dredging and filling, development and human activity.

(New York State Department of Environmental Conservation)



Threats to Marshes

- Monocultures - when a single species takes over a region of vegetation.
- Pollution
- Development
- Sea level rise



Why Marshes Matter

- Storm protection
- Cleaner water
- Wildlife habitat
- **Carbon Storage**



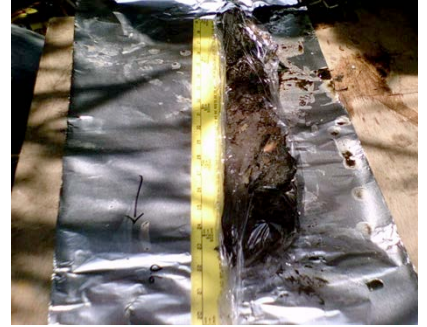
Yellow-crowned Night Herons
Photo by Stephen Kovari

Why Core the Marsh?

- Cores can tell us about the history of the marsh
- We test for:
 - Climate changes in the past (helping us to predict the future)
 - Amount of Carbon and Nitrogen Isotopes
 - Signs of pollution and human impact
 - Levels of organic and inorganic matter

Definitions

Peat - organic matter that contains carbon.



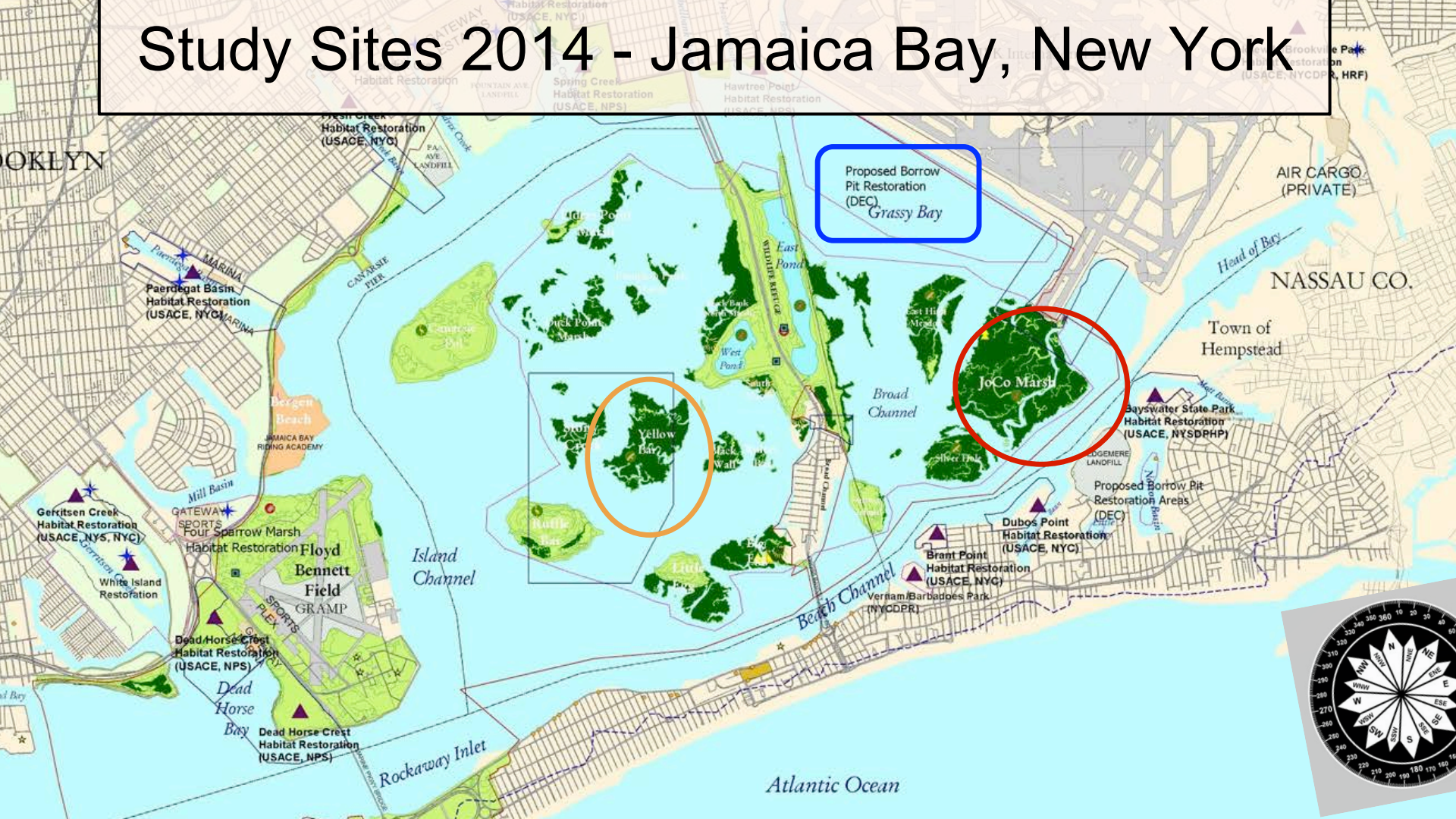
Carbon sinking - the process by which carbon is removed from the atmosphere

“Blue Carbon” - carbon that is sequestered in coastal/marine ecosystems

Question

How have the carbon sequestration capabilities of Jamaica Bay marshes been changing over time, and what drives these changes?

Study Sites 2014 - Jamaica Bay, New York



The Marshes



Methodology

Loss On Ignition (LOI)

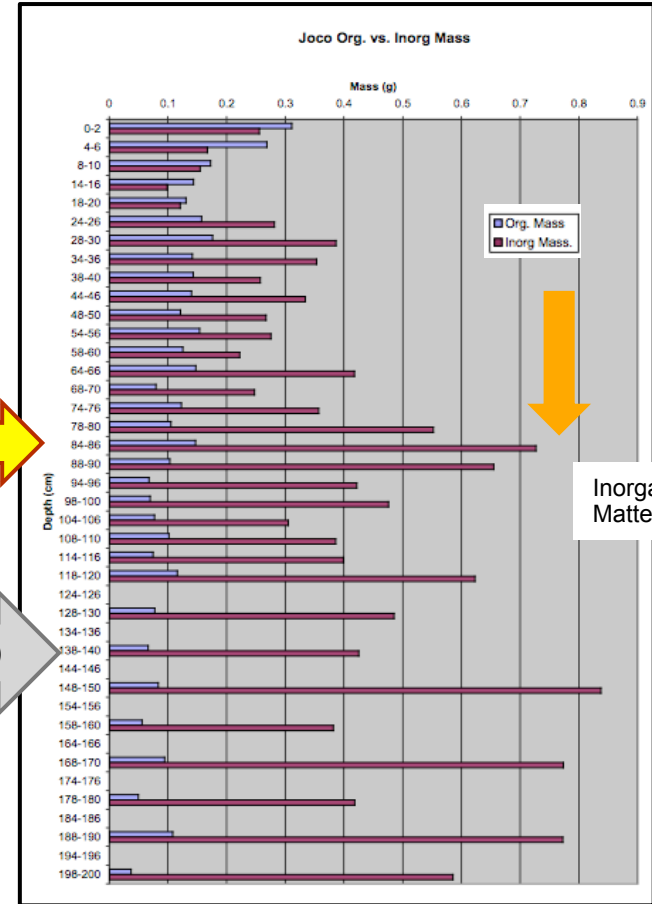
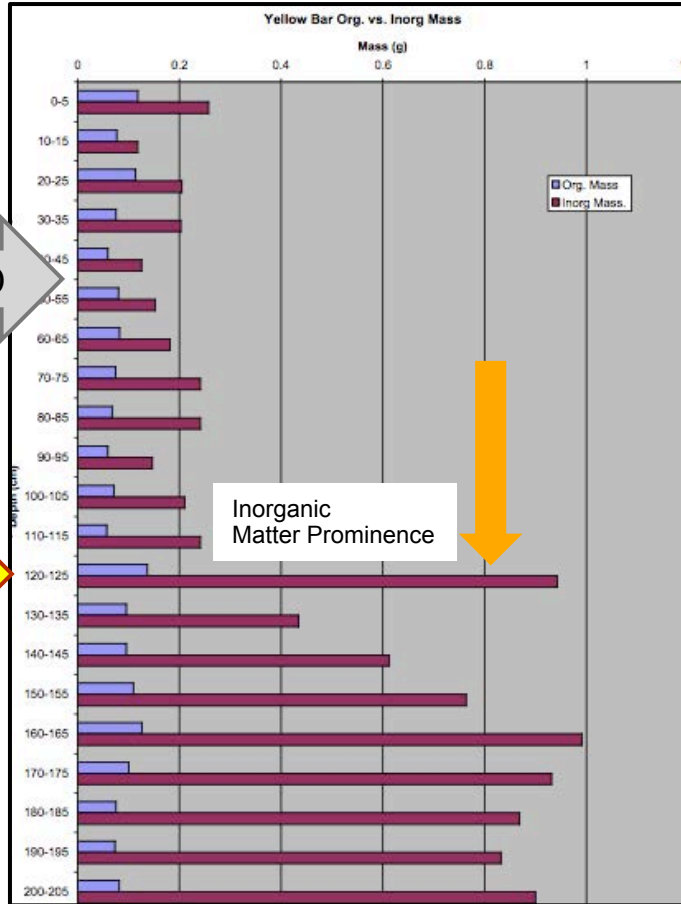
LOI (Loss on Ignition) analysis is used to determine the organic matter content (%OM) of a soil sample. It is a non-chemical process in which soil sample is dried and then burned to zero-percent organic matter.

LOI Test

- Weighing
- Drying
- Burning

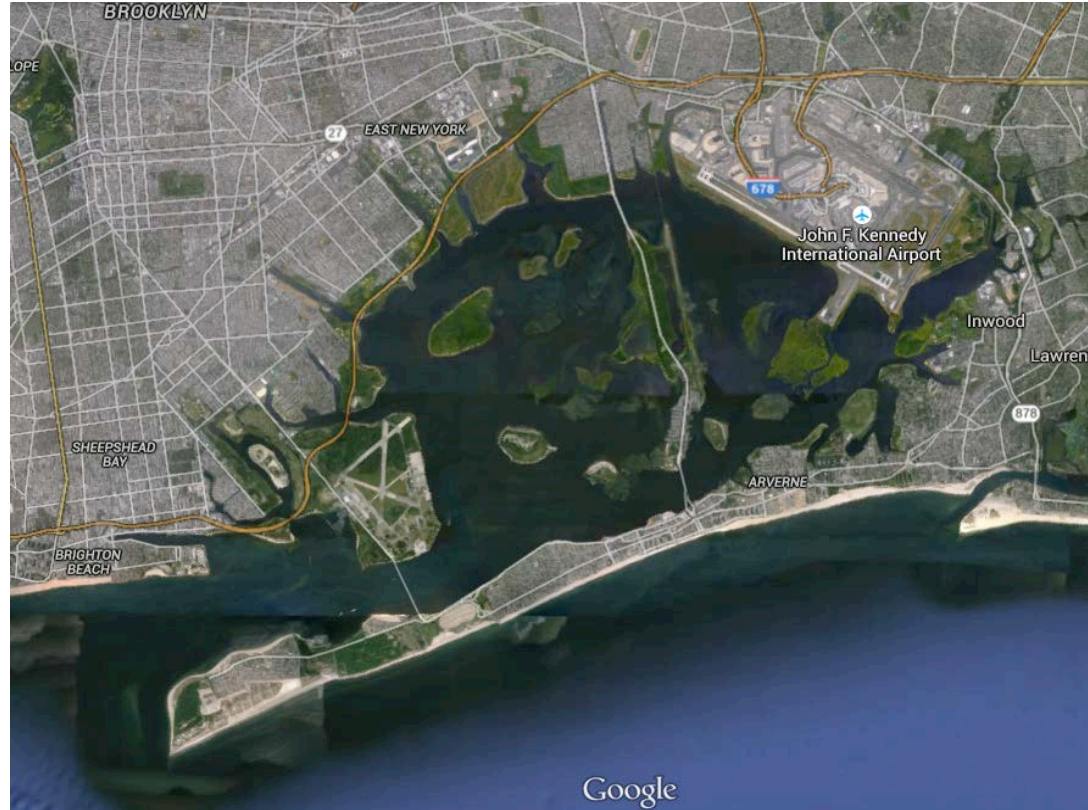


Results - Yellow Bar and JoCo 2000

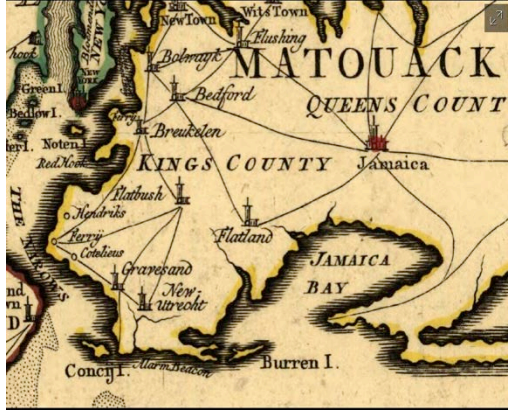


Sand, Silt and Clay is brought in from the ocean currents – so we looked at Paleogeography

Jamaica Bay 2015
(Google Earth)



Jamaica Bay 1700s and 1800s

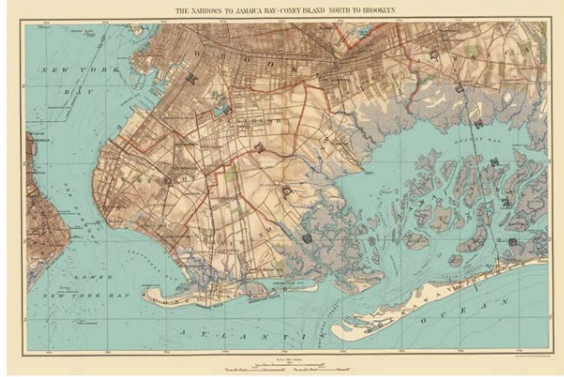


1700s

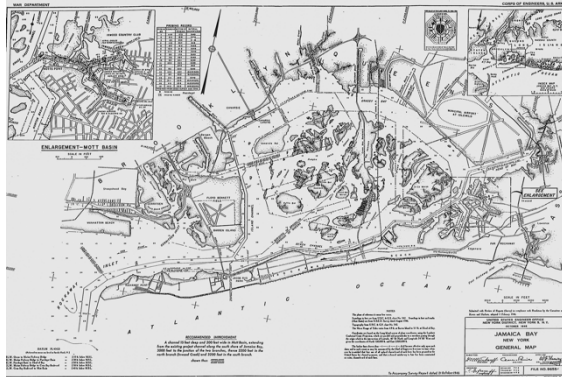


1800s

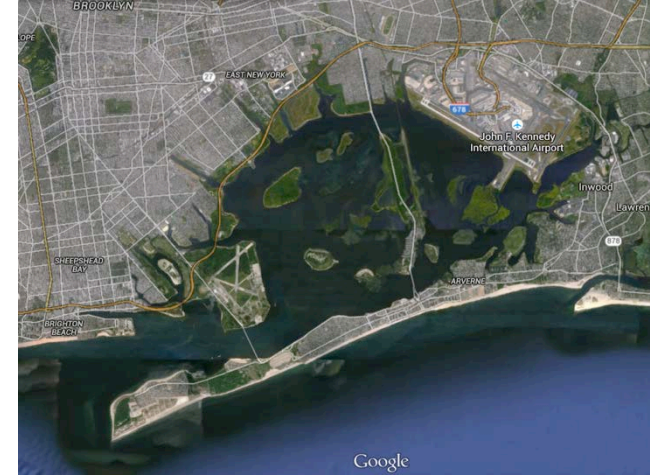
Jamaica Bay 1890s - Current



1890



1948
Army
Corps of
Engineers



Current

[Breezy Point Spit
Transformation](#)

Borrow Pits

- Sandmining for commercial construction aggregate and for landfilling projects has left deep depressions below the bay floor.
- These characteristics can result in stratification, reduced current velocities, and poor water exchange within the pits.
- Poor circulation often leads to impaired sediment quality and water quality from the accumulation of fine grain sediments and depressed dissolved oxygen concentrations.





Conclusion/Discussion

How have the carbon sequestration capabilities of Jamaica Bay marshes been changing over time?

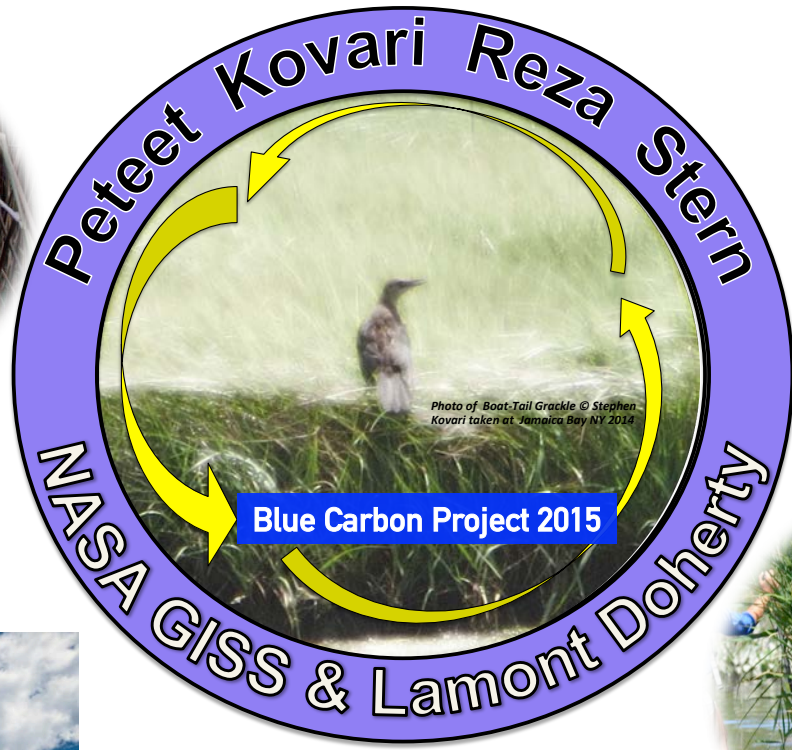
Inorganic matter has been stifled over the past 250 years

What drives these changes?

1. Reduction in current flow of ocean water into Jamaica Bay.
2. Deep Borrow Pits that alter water flow within the marshes

Acknowledgements

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Questions?

Feel free to contact us if any come to mind at a later point in time:

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References

Definition of marshes: <http://oceanservice.noaa.gov/facts/saltmarsh.html>

Jamaica Bay: <http://www.dec.ny.gov/lands/5489.html>

Wigand, C. et. al.: Environ Monit Assess (2007) 131:71–81 DOI 10.1007/s10661-006-9457-5

MAPS

<http://www.loc.gov/maps/collections>

<http://hcl.harvard.edu/libraries/maps/>